



IB MYP Year 5

Year 10 Extended Mathematics

Assessment #8



# PATTERNS IN PROBABILITY

Unit Question: How do we remember what we have learned? Name: Elizabeth Kot  
 Area of Interaction: ATL Teachers: Ms. Li, Mr. So, and Mr. Wong  
 Date: May 31, 2013 Time Allowed: Single Lesson  
 Concept Statement: You will always find previous knowledge useful in future situations.

The objective of this task is to find a pattern in probability in a table tennis game using knowledge from both this year and last year.

## PREPARATION:

- ◆ From year 9, revise what you have learned about **probability**.
- ◆ From year 10, revise what you have learned about **sequences** and **series**.

## INSTRUCTIONS:

- ◆ Show all **steps** and proper **units** on the **lined paper** provided.
- ◆ Submit **your own work**. Any copying or other cheating, will automatically receive a 0.
- ◆ You are allowed to use non-electronic **dictionary**.
- ◆ **Calculators** are allowed.

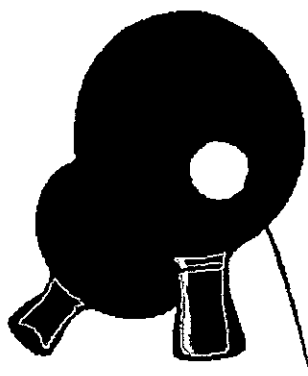
## ASSESSMENT:

- ◆ Read **all the questions** first, then the **criteria descriptors** and **task-specific clarifications** carefully before you start your work. This will give you a clear understanding of what is required and what a high quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest levels in this task.
- ◆ This task assesses Criterion B.

## CRITERION B: INVESTIGATING PATTERNS

Achievement level	Task Specific Rubric	IBO Published Descriptor	Student's Self-Evaluation
0	The student does not reach a standard described by any of the descriptors given below.	The student does not reach a standard described by any of the descriptors given below.	3 (0-8)
1-2 Do Maths	You are able to answer the early questions, and order your answers in a way that reveals patterns.	The student applies, with some guidance, mathematical problem-solving techniques to recognize simple patterns.	
3-4 General Rule	You develop appropriate systematic methods in order to answer the questions. The results you get help you to suggest a mathematical rule using a, b and N.	The student applies mathematical problem-solving techniques to recognize patterns, and suggests relationships or general rules.	Teacher's Final Grade
5-6 Test it	You continue with the questions, and use questions 6 and 7 as a check on your findings.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, and draws conclusions consistent with findings.	
7-8 Prove it	You are able to justify or prove your answer to question 6.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, draws the correct conclusions consistent with the correct findings, and provides justifications or proofs.	

# PATTERNS IN PROBABILITY



I play table tennis against a friend. The probability I win a point is  $a$  and the probability she wins a point is  $b$ . These probabilities stay constant throughout the game.

(**Important Note:**  $a \neq b$  While two table tennis players can have the same skill level, in general one player is better. This will be important in question 7.)

**A game is won only when a player wins two consecutive points.**

*So, for example, I might win a game where the point rallies go: WLWLWLWLWW (that is, I win the game because I won the final 2 points).*

***In the following, simplify your answers wherever possible.***

1. Write a simple relationship between  $a$  and  $b$ .
2. What is the probability I win the first two points (and so win the game)?
3. What is the probability the game lasts for 3 points and I win?
4. What is the probability the game lasts for 4 points and I win?


*(You may like to repeat question 4 for when the game lasts for 5 points, or 6, or 7 and so on.)*

5. Describe mathematically any patterns you find in these probabilities.
6. What is the probability, in terms of  $a$  and  $b$ , that the game lasts for  $N$  points and I win?
7. If  $a = 0.6$ , show that the probability I win a game in 5 points or less is approximately 0.625.
8. Write a **proof** or **justification** of your answer to question 6.

~ End of Assessment ~

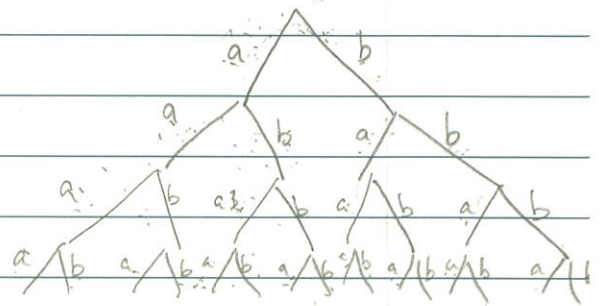
1)  $a + b = 1$

2)  $\frac{1}{4}$



3)  $\frac{1}{8}$

4)  $\frac{1}{16}$     5pts:  $\frac{1}{32}$     6pts:  $\frac{1}{64}$     7pts:  $\frac{1}{128}$



5) The pattern that I find in these possibilities is that each time the probability is multiplied

by  $\frac{1}{2}$ . For example, Q2's probability is  $\frac{1}{4}$  and by multiplying  $\frac{1}{2}$ , we get the answer of  $\frac{1}{8}$  in Q3.

6)

7)  $0.6 \times 0.6 + 0.4 \times 0.6 \times 0.6 + 0.6 \times 0.4 \times 0.6 \times 0.6 + 0.4 \times 0.6 \times 0.4 \times 0.6 \times 0.6$   
 $= 0.36 + 0.144 + 0.0864 + 0.03456$   
 $= 0.62496$   
 $= 0.625 \text{ (3 sig. fig.)}$

8)